G-507

56

Customer: Goddard Space Flight Center;
Lawrence R. Thomas
Payload Mgr: James Houston
NASA Tech Mgr: Neal Barthelme
Mission: STS-40, June 5, 1991

This experiment called the Orbiter Stability Experiment (OSE), developed at Goddard Space Flight Center, measured the shuttle's spectrum of small angular motions (or "jitter") produced by the operation of mechanical systems, thruster firings and human motions during normal crew activity.

In addition to the vibration measurements that were made, Goddard's GAS can also carried a passive experiment to test the effects of radiation on photographic film. The experiment was developed and provided by Dr. Ernest Hammond of Morgan State University, Baltimore, Maryland.

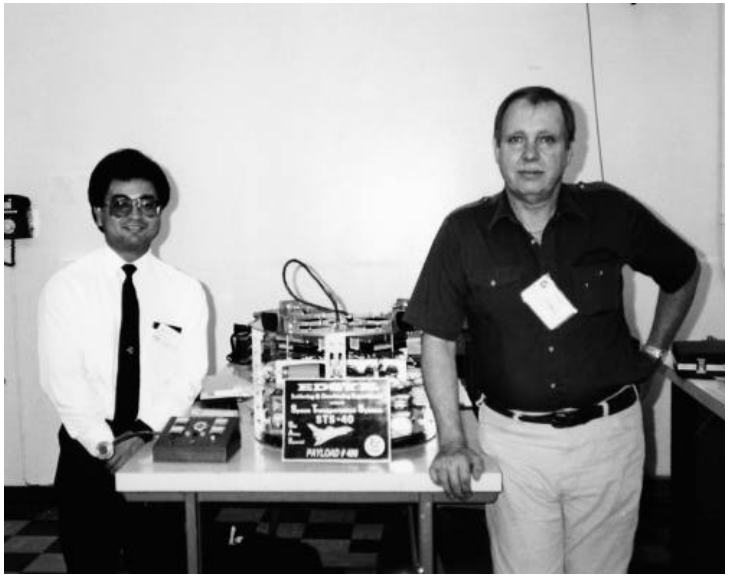
In addition to Dr. Werner Neupert's microgravity measurement experiment, G-507 carried two experiments developed by Dr. Ernest Hammond of Morgan State University.

G-486

57

Customer: EDSYN, Inc.;
William S. Fortune
Payload Mgr: Wayne A. Murray
NASA Tech Mgr: Bernard Karmilowicz
Mission: STS-40, June 5, 1991

No information on this payload was provided by the sponsor, EDSYN, Inc. of Van Nuys, California.



(R to L) Bernard Karmilowicz and a representative from Edsyn, Inc. finalized G-486 for flight on STS-40.

G-286

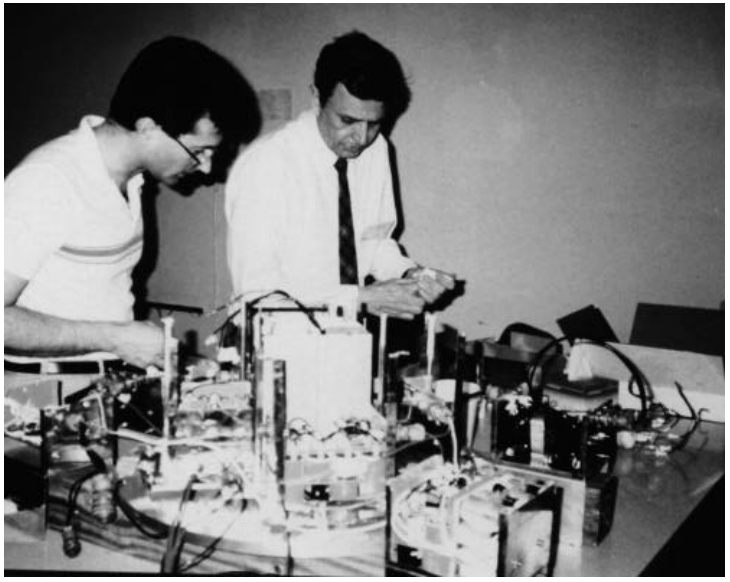
58

Customer: OMNI International, Ltd./
Duke University; Beth Howard
Payload Mgr: F. H. Cocks
NASA Tech Mgr: Don Carson
Mission: STS-40, June 5, 1991

The scientific aim of this payload was to demonstrate the feasibility of producing, in orbit, foams of ultralight metals for possible application as shock-absorbing panel-backing. This backing would be used to improve the shielding of both manned and unmanned vehicles and satellites, including Space Station Freedom, against hypervelocity impacts either from micrometeoroids or orbiting debris.

The concept of using ultralight, reactive alloys in the space environment, where their reactivity is not an issue, offers many advantages in the engineering of large-scale space structures. Similarly, the idea of using metal foams made from such alloys as shock-absorbing backing to improve the effectiveness of satellite armor may offer substantial benefits in the design of Space Station Freedom.

The payload was built at Duke University in the Department of Mechanical Engineering and Materials Science. The project was supported by Omni Magazine, which offered the canister as part of a national contest in 1983, and by the School of Engineering in subsequent years.



The NASA Technical Manager, Don Carson (L), and F. Hadley Cocks prepared G-286 for final testing. This experiment was a prime example of how industry, education, and government can come together for advancement in the sciences.

G-021

59

Customer: European Space Agency; Giuseppe Reibaldi
Payload Mgr: Manfred Trischberger
NASA Tech Mgr: Richard Hoffman
Mission: STS-40, June 5, 1991

This experiment, sponsored by the European Space Agency (ESA), was part of ESA's In-Orbit Technology Demonstration Program, which makes use of flight opportunities available on European and American carriers to fly technology experiments.

The objective of the experiment was to test a new kind of very sensitive, highly miniaturized accelerometer, intended for applications on a number of ESA space missions. Using a block of silicon material etched to create a frame with a mass suspended on two beams, the experiment was devised to subject accelerometers to known vibration stimuli while in the microgravity environment of the shuttle orbit.

As a result of the extreme sensitivity of the accelerometers, noise created by the crew or shuttle systems could have reduced the quality of the measurements. Because of this, the crew switched on the experiment prior to a sleep period. The experiment worked autonomously and lasted about 3 hours.

The payload was designed and built by two Swiss companies, Compagnie Industrielle Radioelectrique S.A. and Centre Suisse D'Elecronique et de Microtechnique S.A.

G-021 was one of many experiments flown in the GAS program that was specifically designed to research and test new space technology.

G-052

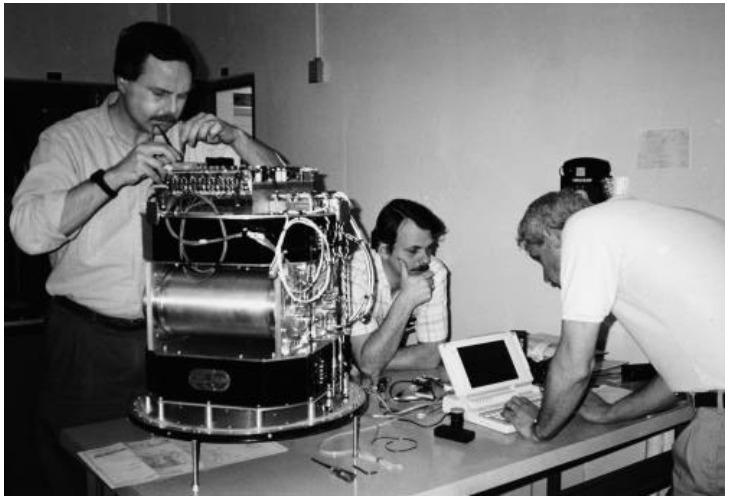
60

Customer: GTE Laboratories, Inc.;
Theresa Graziani
Payload Mgr: Alfred Bellows
NASA Tech Mgr: David W. Peters
Mission: STS-40, June 5, 1991

This experiment was designed to grow crystals of gallium arsenide (GaAs). GaAs is a versatile electronic material used in high speed electronics and optoelectronics.

The payload was designed to grow two selenium-doped GaAs crystals. The crystals would grow to be 1 inch in diameter by 3.5 inches long by using a gradient freeze growth technique. Growth of the two crystals in space was part of a comprehensive research program to systematically investigate the effect of gravity-driven fluid flow on GaAs crystal growth.

The payload was designed and constructed at GTE Laboratories in Waltham, Massachusetts and was jointly sponsored by GTE, NASA's Lewis Research Center, Cleveland, Ohio, and the U.S. Air Force Wright Research and Development Center Materials Laboratory, Dayton, Ohio. Scientists from each research institution contributed to characterization of the space-grown crystals.



(L to R) Glen Duchene, Dave Peters and Al Bellows did some final verifications on the G-052 payload.

G-091

61

Customer: CSUN Aerospace Group; Joan Yazejian
Payload Mgr: Jeff Craddock
NASA Tech Mgr: Fran Mosier
Mission: STS-40, June 5, 1991

A team of researchers from California State University, Northridge (CSUN) built an experiment apparatus called the Orbital Ball Bearing Experiment (OBBEX) to test the effects of melting cylindrical metal pellets in microgravity.

One of the goals of the OBBEX was to create the world's first seamless, hollow ball bearing. The hollow characteristic of the ball could improve the service life rating of a ball bearing. This would permit higher speeds and higher load applications and possibly reduce the friction encountered in normal operation.

With faculty support, the OBBEX was designed and built as part of a senior year design project at California State University, Northridge. Funding for the experiment was provided by two Southern California companies: Moore Industries, Inc., a manufacturer of industrial control systems, and Industrial Tektronics, Inc., a specialty bearing manufacturer. Additional funding was supplied by the Aerospace Corporation, the CSUN Foundation, and several individuals.

(L to R) Joan Yazejian, Jeff Craddock, Fran Mosier, and Walter Waring stood beside the Orbital Ball Bearing Experiment which was designed to melt cylindrical metal pellets in microgravity.

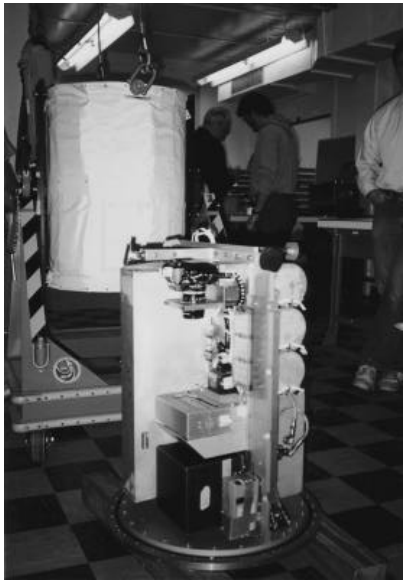
G-105

62

Customer: Alabama Space & Rocket Center; Charles A. Lundquist
Payload Mgr: Francis C. Wessling
NASA Tech Mgr: Lawrence R. Thomas
Mission: STS-40, June 5, 1991

Scientists at the University of Alabama in Huntsville (UAH) used five experiments to study possible commercial in-space processing opportunities. Those experiments and another in cosmic ray research were cosponsored by UAH's Consortium for Materials Development in Space and the U.S. Space and Rocket Center in Huntsville.

While Columbia was in orbit, two experiment packages in the canister attempted to process organic films and crystals that might be used in optical communications and computers. Another tried to electroplate metals to study special catalytic or reactory properties, or resistance to corrosion. A fourth experiment studied technology used to refine and process organic materials such as medical samples. The fifth UAH experiment was designed to collect cosmic ray interactions on film emulsion while also helping scientists assess materials that may be used in future massive cosmic ray detectors. The sixth experiment which studied the effects of cosmic radiation on the chromosomes and genes of a common yeast was provided by the U.S. Space and Rocket Center.



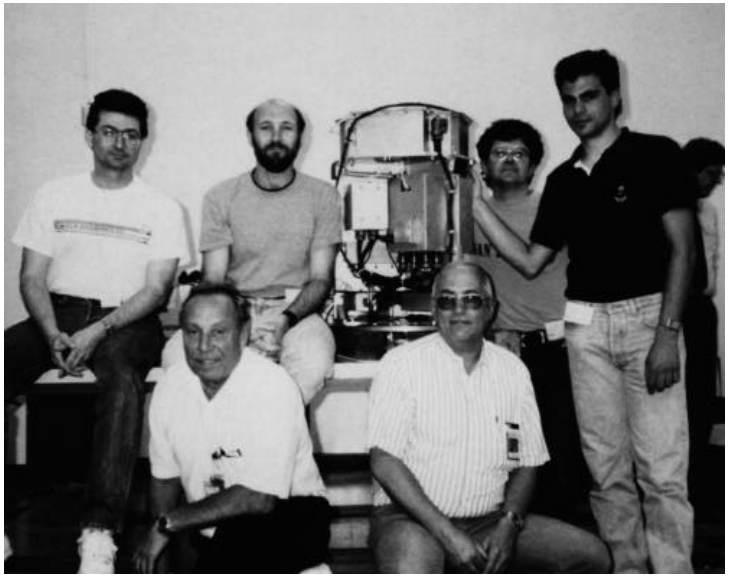
The GAS canister that housed G-105s six experiments was hoisted over and onto G-105.

G-408

63

Customer: The Mitre Corporation;
Robert C. Labonte
Payload Mgr: Fred Looft
NASA Tech Mgr: Don Carson
Mission: STS-40, June 5, 1991

Five student experiments from the Worcester Polytechnic Institute were included in one GAS can. One attempted to grow large zeolite crystals. Another studied the behavior of fluids in microgravity. A third, the Environmental Data Acquisition System, tried to record information about sound, light, temperature, and pressure within the GAS can. The fourth attempted to measure the acceleration of the shuttle along three axes with a high degree of precision. A fifth experiment studied the fogging of film in space.



(Top L to R) Don Carson, Fred Looft of Worcester Polytechnic Institute, Larry Moschini, Dino Roberti, (bottom L to R) Gary Walters, and Larry Thomas gathered around this diverse group of experiments that comprised G-408.

G-405

64

Customer: Frontiers of Science Foundation; Darren Lazarus
Payload Mgr: Craig Friedrich
NASA Tech Mgr: Lawrence R. Thomas
Mission: STS-40, June 5, 1991

This payload was designed to provide data concerning the formation of six insoluble inorganic chemical precipitates. The experiment investigated the rate of formation and terminal size of precipitate particles when the growth was not impaired by settling due to gravity.

The experiment was sponsored by the Frontiers of Science Foundation of Oklahoma, a private, non-profit organization established to promote science education within Oklahoma, in conjunction with Louisiana Tech University. In 1983, the foundation sponsored a contest among high school students to conceptualize an experiment which would fly aboard the shuttle. The payload was completed at the Louisiana Tech University where the payload manager serves on the faculty in mechanical engineering.

After flight and analysis of the data, the payload was donated and displayed at the Oklahoma Air and Space Museum in Oklahoma City.

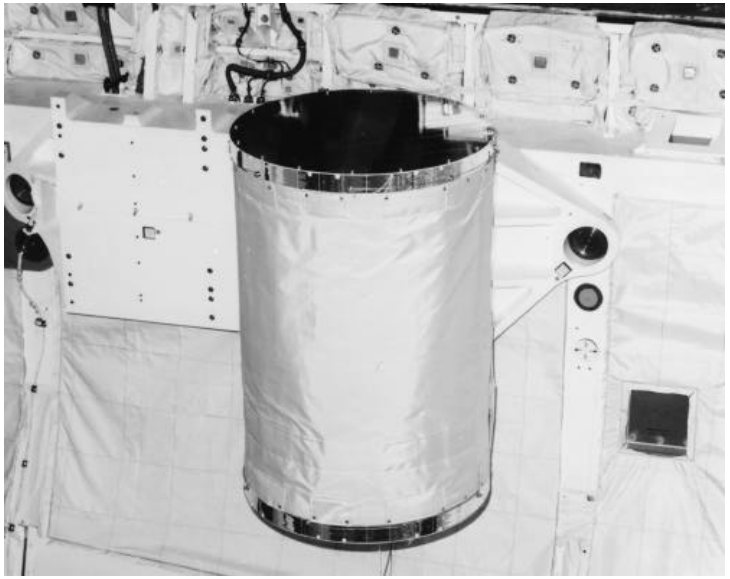
(L to R) Henry Fitch, Larry Thomas, and Craig Friedrich discussed the experiments on this educational payload.

G-451

65

Customer: Nissho Iwai American; M. Ohba
Payload Mgr: M. Ohba
NASA Tech Mgr: Herbert Foster
Mission: STS-40, June 5, 1991

The Nissho Iwai American Corporation in New York, NY sent 19 varieties of flower and vegetable seeds into space to determine how the unknown variables of microgravity would affect seed growth. After the shuttle landed and the seeds were recovered, the company planned to distribute the seeds widely to amateur growers.



Determining the affect of microgravity on seeds was an important step to establishing if seeds could be germinated in space. The can in this photo is an example of the sealed GAS canister used by the Nissho Iwai American Corporation.

G-455

66

Customer: Nissho Iwai American;
A. Machida
Payload Mgr: M. Ohba
NASA Tech Mgr: David Shrewsberry
Mission: STS-40, June 5, 1991

This payload was developed to investigate the potential advantages of crystal growth under microgravity. There were two experiments: PbSnTe crystal growth from vapor and GaAs crystal growth from metallic solution. The payload was sponsored by Fujitsu Limited in Kawasaki, Japan, and Nissho Iwai Corporation in Tokyo.

The GAS program has offered the opportunity for international organizations to fly small payloads on the shuttle.

G-616

67

Customer: Thomas Hancock
Payload Mgr: Thomas Hancock
NASA Tech Mgr: Charles Kim
Mission: STS-40, June 5, 1991

This payload consists of two experiments. The first investigated static computer memory (floppy disks) to determine if cosmically charged particles would produce changes in data integrity or structure. The second looked for changes in the physiology or growth of 38 different types of plant seeds. Each cultivator was examined post-flight in comparison with control samples from the same seed lot that remained on the Earth, for a wide variety of possible effects or changes.

Several of the floppy disks contained programs developed by elementary school students. In addition, a large number of plant seeds were to be distributed to every elementary and junior high school student in the Redlands, California Unified School District, the sponsor of the experiment.

G-616 provided an interactive, controlled experiment process to elementary and junior high school students.